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LARYNGEAL MASK AIRWAY: A POSTOPERATIVE SORE
THROAT CLINICAL PRACTICE GUIDELINE

by

Logan Alan Williams

A Doctoral Project
Submitted to the Graduate School,
the College of Nursing and Health Professions
and the School of Leadership and Advanced Nursing Practice
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Nursing Practice

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ABSTRACT

One of the most common and preventable complications experienced by patients undergoing general anesthesia is a postoperative sore throat (POST). Up to 70% of patients who receive a laryngeal mask airway (LMA) during anesthesia suffer from POST. Despite its regular occurrence and designation as a minor complication, POST has proven to be a distressing complication for patients afflicted. Consequently, a perceived minor complication can, in fact, play a major role in a patient's perception of their care, the skill of their anesthesia provider, and their overall satisfaction with their experience.

Evidence shows that inflation of LMA cuffs beyond the recommended 60cm H₂O could play a prominent role in the development of POST due to the high pressures exerted on oropharyngeal structures. A thorough review of current evidence demonstrates that evidence-based interventions are available to providers that can significantly reduce the incidence and/or severity of POST. In the case of overinflated LMA cuffs, the use of manometers immediately after LMA insertion allows the provider to adjust cuff pressures to ensure that an adequate seal is maintained while remaining below the maximum recommended pressures.

Utilizing the evidence, this project sought to make a policy recommendation to a panel of experts at a medium-sized regional hospital in southeast Mississippi. After presenting this information to the panel as well as other anesthesia staff, an evaluation tool was used to collect feedback and recommendations regarding the policy recommendation. After analyzing the feedback, it was determined that the panel and staff were amenable to implementation of a policy requiring manometry monitoring on

any patient undergoing general anesthesia with an LMA. A policy recommendation and executive summary were constructed to be presented to the panel for the possibility of implementation at their facility.

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DEDICATION

I would like to dedicate this doctoral project to my entire family. To my incredible wife, Nicole Williams, I fully understand that without your unyielding support and tireless sacrifices over the last three years, completion of this project would not have been possible. To my beautiful daughter, Mia Williams, you are always able to brighten even the darkest of days. Your innocence and zest for life inspire me to be a better person. To my parents, Keith and Vivian Henry, for all the encouragement and support you have provided throughout my life, I am forever grateful. I would also like to dedicate this project to the memory of my father Mark Williams.

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LIST OF ABBREVIATIONS

<i>CRNA</i>	Certified Registered Nurse Anesthetist
<i>DNP</i>	Doctor of Nursing Practice
<i>ETT</i>	Endotracheal Tube
<i>IRB</i>	Institutional Review Board
<i>LMA</i>	Laryngeal Mask Airway
<i>POST</i>	Postoperative Sore Throat
<i>SAD</i>	Supraglottic Airway Device
<i>SGA</i>	Supraglottic Airway
<i>USM</i>	The University of Southern Mississippi

CHAPTER I - INTRODUCTION

A postoperative sore throat (POST) is one of the most common and predictable complications experienced by patients undergoing general anesthesia. Although it is more commonly associated with tracheal intubation, the use of laryngeal mask airways (LMA), a type of supraglottic airway device (SAD) that is now widely used, also poses a significant risk for the development of POST (El-Boghdadly, Bailey, & Wiles, 2016). The reason for the development of POST after LMA use is multifactorial and may include any, or all the following: (a) the choice of supraglottic airway device (SAD), (b) insertion technique, and (c) perioperative intracuff pressures (El-Boghdadly et al., 2016). While all these factors should be further evaluated, the choice of the SAD and the insertion technique may often be influenced by what is available at the facility and the provider's preferred insertion method. However, monitoring intracuff pressures perioperatively is a simple and inexpensive method that has been shown to decrease the incidence and severity of POST. A simple device called a manometer can quickly provide the clinician with accurate intracuff pressure readings allowing for adjustment of the pressures to the recommended limits.

The goal of this project was to develop a clinical practice guideline and policy to increase the use of intraoperative manometry monitoring in hopes of decreasing the incidence of postoperative complications, namely POST. The reduction of this common and undesirable postoperative complication has the potential to lead to better patient outcomes. The reduction of POST could also lead to patients viewing their surgical experience more favorably and lead to higher patient satisfaction.

Problem Description

POST occurs in 30% to 70% of patients undergoing general endotracheal anesthesia and evidence suggests that it may also approach up to 70% of patients after general anesthesia utilizing an LMA for airway securement (Dorsch & Dorsch, 2008). While POST is typically self-limiting, the complication is described by patients as one of the top ten most undesirable outcomes (Kalil, Silvestro, & Austin, 2014). The symptoms of POST typically peak around 2-6 hours postoperatively, but reports indicate that 11% of patients continuing to have symptoms after 96 hours will have residual symptoms (Jaensson, Gupta, & Nilsson, 2012).

As previously stated, various factors may play a role in the development of POST. However, multiple studies have concluded that the use of a manometer to monitor intracuff pressures of both endotracheal tubes (ETT) and LMAs reduced the incidence of pharyngolaryngeal complications, including POST (Ashman, Appel, & Barba, 2017). One randomized trial showed that use of manometry significantly reduced the incidence of all pharyngolaryngeal complications, including POST, with the control group have a complication rate of 45.6% versus only 13.4% in the manometry group (Seet et al., 2010).

More recent evidence suggests that clinicians routinely and needlessly overinflate LMA cuffs (Bick, Bailes, Patel, & Brain, 2014). Maximum recommended LMA cuff pressures should not exceed 60 cm H₂O (Dorsch & Dorsch, 2008). However, evidence indicates that up to 70% of LMA cuffs exceed the 60 cm H₂O threshold (Bick et al., 2014). That such a large percentage of LMA cuffs exceed the maximum pressure could

indicate a lack of awareness by clinicians who may be inflating the cuffs to the maximum recommended volumes without considering cuff pressures at all (Bick et al., 2014).

Because of the regular incidence of POST, it is often regarded by patients and anesthesia staff alike as an expected occurrence after general anesthesia; therefore, the presence of these disturbing symptoms may be regarded as an important measure of quality and patient satisfaction (Jaensson et al., 2012). Further understanding of the incidence of this complication can lead to policies and interventions designed to decrease its occurrence and improve patient outcomes.

Available Knowledge

An extensive review of the evidence was performed to garner a comprehensive knowledge of LMA design, use, and any correlation that might exist between its use and postoperative complications, namely sore throat. A number of anesthesia texts were reviewed to better understand the design of LMAs as well as proper techniques and usage as perioperative airway devices. A thorough review of the evidence was performed utilizing search databases including CINAHL, EBSCOhost, MEDLINE, and Google Scholar to obtain the most recent evidence concerning the use of LMAs and their relationship to postoperative complications, as well as how the use of manometers might mitigate these complications.

LMA Design

The use of SADs in the United States began with the introduction of the LMA. Invented by Dr. Archie Brain, the LMA was approved by the U.S. Food and Drug Administration in 1991, though it was already being used widely across the United Kingdom (Barash et al., 2013). Originally designed for use when tracheal intubation was

unable to be achieved, the LMA was soon being utilized in cases where ETTs were traditionally being employed (Barash et al., 2013). Data soon suggested that the use of LMAs in lieu of ETTs was accompanied by a reduced incidence of pharyngolaryngeal complications, including POST, coughing, and laryngospasm on emergence (Barash et al., 2013).

The LMA family is comprised of a variety of designs and unique abilities; however, the focus of this project was on the LMAs that are most frequently used in daily practice. The original design of the LMA consisted of a small mask connected to the end of a curved tube. The inner rim of the mask is surrounded by an inflatable cuff that is designed to fit in the hypopharynx. A self-sealing pilot balloon and inflation tube are attached to the proximal end of the mask (Dorsch & Dorsch, 2008). The original LMA classic was made of silicone and was designed for reuse. The more ubiquitous LMA unique, however, is designed for single use and is made of polyvinylchloride instead of silicone (Dorsch & Dorsch, 2008).

Other LMA designs include the LMA flexible and the innovative I-Gel. The LMA flexible was designed for use in cases in which the airway must be out of midline placement or may be shared with the surgical team (Barash et al., 2013). The LMA flexible differs from the classic and is unique in that it consists of a longer, flexible, wire-reinforced tube that allows it to be bent at multiple angles without being kinked (Dorsch & Dorsch, 2008). The kink-resistant tube is also useful in procedures in which the surgical drapes must be placed over the patient's head and airway (Barash et al., 2013).

The I-Gel is a new generation SAD that differs from its predecessors in several ways. Unlike prior incarnations of SADs, the I-Gel consists of a "solid, elastomer body,

mounted on a plastic barrel, with no inflatable cuff’ (Barash et al., 2013, p. 773). The cuff was designed to conform to a variety of throat shapes to achieve a seal without the use of an inflation cuff (de Montblanc, Ruscio, Mazoit, & Benhamou, 2014). One study of the I-Gel indicated that its use may result in quicker insertion times and a lower incidence of POST when compared with first and second generation LMAs (de Montblanc et al., 2014).

LMA Insertion Technique

Insertion of an LMA does not require the same level of airway manipulation that is required for tracheal intubation. Various techniques for LMA insertion exist, some of which might lower the incidence of pharyngolaryngeal trauma. Several of these methods will be discussed, including the currently recommended techniques.

Prior to insertion of the LMA, assessment of the patient’s airway must be done to determine the correct size to be used. Current LMA sizing is based on patient weight in kilograms. The appropriate sizing for LMAs is illustrated in Table 1.

Table 1

LMA Sizing

LMA Size	Patient Size (kg)	Maximum Cuff Volume (ml of Air)
1	Up to 5	4
1.5	5-10	7
2	10-20	10
2.5	20-30	14
3	30-50	20

Table 1 (continued).

4	50-70	30
5	70-100	40

Note: Adapted from Dorsch, J. A., & Dorsch, S. E. (2008). Understanding anesthesia equipment (5th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Choosing a size for LMA insertion can be difficult, so providers must be sure that more than a single size always available. Dorsch and Dorsch (2008) suggest the provider should opt for the larger size for the initial attempt and that evidence suggests that a size 4 LMA is typically the appropriate size for adult females, while a size 5 LMA would be appropriate for most adult males. The size of the LMA is important for several reasons. If the LMA is too small, achievement of a proper seal over the larynx may not be achieved and will result in gas leaks during positive pressure ventilation. If the LMA is too large, the device will not properly seat in the hypopharynx and could lead to higher incidences of pharyngolaryngeal complications, including POST (Dorsch & Dorsch, 2008).

Several insertion techniques are described in the literature. The standard technique of insertion described by Dorsch and Dorsch (2008) consists of fully deflating the LMA cuff and using a midline approach of insertion after placing the patient in the sniffing position (head extended with flexion of the neck). A non-anesthetic lubricant is applied to the palatal portion of the mask (Barash et al., 2013). The provider then grasps the shaft of the LMA placing the index finger at the portion of the mask where the shaft connects with the mask. The tip of the cuff and the mask are pressed against the hard palate with the index finger until the tip reaches the posterior pharynx where it should

then follow it downwards as the provider continues to use the index finger as a guide (Barash et al., 2013). Inflation of the cuff should then be inflated with the “minimal amount of gas to form an effective seal” (Barash et al., 2013, p. 770). Barash et al. (2014) also indicate that the pilot valve pressure should not exceed 60 cm H₂O.

Alternative insertion techniques consist of leaving the LMA cuff partially or fully inflated during insertion and the 180-degree technique in which the LMA is inserted with the mask opening facing the palate until it reaches the oropharynx, at which time it is rotated 180 degrees and advanced into the hypopharynx (Nagelhout & Plaus, 2014). The relevant literature states that SAD insertion with the cuff fully inflated did show a reduced incidence of POST and less evidence of blood on the SAD suggesting less evidence of laryngopharyngeal trauma (Middleton, 2009).

Another insertion technique that has been associated with, not only a higher insertion success rate but also a lower incidence of POST is the 90-degree rotational technique (El-Boghdadly et al., 2016). This technique is accomplished by inserting the device midline and rotating the device in a counter-clockwise fashion until resistance is met, then rotating it clockwise 90 degrees until it is back to the midline (El-Boghdadly et al., 2016).

Postoperative Sore Throat

A post-operative sore throat is a common and seemingly expected consequence of general anesthesia. Despite its frequent occurrence, the etiology of POST is not completely understood (Michalek, Donaldson, Vobrubova, & Hakl, 2015). While obtaining informed consent, anesthesia providers generally inform patients of the possibility of developing POST and refer to it as a minor complication. However,

patients may not consider it a minor post-operative discomfort and consider its “avoidance as being of great importance” (El-Boghdadly et al., 2016, p. 706).

The development of POST after general anesthesia is multifactorial. Factors that affect its incidence can include instrumentation of the airway, the type of airway device being used, age, gender, and duration of anesthesia (El-Boghdadly et al., 2016).

Interestingly, one factor that does not seem to play a significant role is the anesthesia provider’s level of expertise (El-Boghdadly et al., 2016). Factors that are directly related to the use of supraglottic airways (SGAs) are listed in Table 2.

Table 2

POST Risk Factors Associated with SGAs

Factor	Mechanism
Insertion technique	The leading edge of the deflated cuff may cause trauma Inflated cuff causes more epiglottic downfolding, which increases POST Repeated attempts are associated with increased POST
Size of device	Smaller sizes of SGAs are associated with less POST
Use of lubricants	Adequate lubrication is essential Lidocaine gel is associated with an increase in POST
Overinflation of the cuff	Some studies have shown decreased POST with intracuff pressure monitoring
Duration of surgery	Increased POST in operations of over 60 minutes duration
Airway gases	Lack of humidification can dry mucosal surfaces and increase POST

Note: Table taken from Michalek, P., Donaldson, W., Vobrubova, E., & Hakl, M. (2015). Complications associated with the use of supraglottic airway devices in perioperative medicine. BioMed Research International. <http://dx.doi.org/10.1155/2015/746560>

Choice of SAD. With various supraglottic devices to choose from, assessment must be made of the role that the choice of the device being used may play in the development of POST. The SGA family is divided into first and second-generation devices. The primary difference between the two generations is the second-generation devices allow for the passage of a gastric tube (de Montblanc et al., 2014). A second-generation device known as the i-gel does stand apart from the others as it does not have an inflatable cuff and conforms to the shape of the individual's throat as it is warmed by body temperature (de Montblanc et al., 2014).

Numerous studies have shown that the incidence of POST is not likely affected when comparing first and second-generation devices, apart from the i-gel (El-Boghdadly et al., 2016). In 18 random control trials, the rate of POST was shown to be decreased in the variable group with a relative risk of 0.59 (0.38-0.90) demonstrating a significant reduction in POST with the use of the i-gel (de Montblanc et al., 2014). These results suggest that a likely reason for the reduced rates of POST associated with the i-gel could be related to the lack of an inflatable cuff (El-Boghdadly et al., 2016).

Insertion Technique. The method of insertion of the LMA could impact the incidence of POST. Traditional methods of inserting the LMA with a deflated cuff has been shown, in some studies to have a higher rate of POST than with insertion with the cuff fully inflated (El-Boghdadly et al., 2016). The devices also were less likely to have blood staining on removal, further suggesting the possibility of increased trauma when inserting the device with the cuff fully deflated (El-Boghdadly et al., 2016).

Cuff Pressures. Except for the i-gel, SGAs require the insertion of air into a cuff to create a seal in the hypopharynx. Unlike ETTs, inflated LMA cuffs do not directly

exert pressure on the tracheal mucosa (de Montblanc et al., 2014). However, LMA cuffs do exert pressures on other oropharyngeal structures that could lead to pharyngolaryngeal complications, including a sore throat (de Montblanc et al., 2014).

Manufacturer's recommendations and various studies have suggested that LMA cuff pressures exceeding the recommended 60 cm H₂O are associated with higher rates of pharyngolaryngeal complications (El-Boghdadly et al., 2016). Concerning LMA cuff inflation, a notation must be made that the manufacturer's maximum recommended volume that can be inserted into an LMA cuff does not correlate with actual intracuff pressures. In fact, inserting the recommended maximum volume of air into a cuff can result in pressures that more than double the recommended 60 cm H₂O (Bick et al., 2014). Furthermore, clinicians routinely use digital palpation of the cuff pilot balloon to estimate pressures. This method of pressure estimation has been shown to be an ineffective measure of intracuff pressure regardless of provider experience (Bick et al., 2014). The only sure method to ensure accurate intracuff pressure readings is by using monometers, which can easily and quickly provide clinicians with accurate pressure readings to allow for adjustments to ensure cuff pressure remain below 60 cm H₂O.

Manometry and Cuff Pressures

Monitoring of SAD cuff pressures could play a significant role in decreasing the incidence of a sore throat. Intra-cuff pressure monitoring using a manometer is an easy, effective way to ensure that cuff pressures do not exceed the maximum recommended 60 cm H₂O. A prospective, randomized trial showed that patients undergoing general anesthesia using an LMA were significantly less likely to suffer postoperative pharyngolaryngeal complications (13.4% in the manometer group versus 45.6% in the

control group) (Seet et al., 2010). Furthermore, POST in the manometer group was 2.1% versus 8.7% in the first 2 hours and 3.1% versus 13.6% in the first 24 hours (Seet et al., 2010).

This same study also concluded that LMA intracuff pressures far exceeded the recommended 60 cm H₂O immediately after insertion. In the pressure limiting group, the mean intracuff pressure was 112 cm H₂O and the routine care group's mean intracuff pressure was 114 cm H₂O (Seet et al., 2010). However, pressures in the pressure limiting group had decreased to a mean pressure of 40 cm H₂O after adjustments utilizing manometry (Seet et al., 2010). This data, coupled with evidence suggesting that utilizing manometry to monitor and adjust intracuff pressures, should compel anesthesia providers to routinely utilize perioperative monitoring of LMA intracuff pressures.

Patient Satisfaction

One of the primary goals of providing guidelines to reduce postoperative complications such as sore throats is to achieve higher levels of patient satisfaction. Imperatively, anesthesia provider must understand, not only what patient satisfaction is, but also how they may directly affect a patient's satisfaction with their surgical experience. Patient satisfaction can be defined as "a comparison between patient expectations of a health-related experience and actual outcomes" (Falco, Rutledge, & Elisha, 2017, p. 287). The comparison between expectations and outcomes means that if patients experience outcomes that do not meet their preconceived expectations, they may feel a certain level of dissatisfaction that may not be reflected in the level of care provided (Falco et al., 2017).

Another aspect of patient satisfaction, which may play an even larger role than expectations, is belief and confidence in their provider (Falco et al., 2017). This knowledge only elevates the significance of the provider understanding the importance of patient expectations and the role it plays in a patient's satisfaction. The importance of patient satisfaction has a direct association with anesthetic care. In fact, the relationship that an anesthetic provider has with the patient during the preoperative, perioperative, and postoperative phase may have a direct correlation with litigation filed against anesthesia providers (Falco et al., 2017). Furthermore, with the recent transition to utilizing patient survey scores to determine reimbursement for certain aspects of health care, one could assume the future reimbursements for anesthetic services could be tied to patient satisfaction scores (Falco et al., 2017).

With the prospects of financial penalties being tied to decreased satisfaction scores, any effort to utilize interventions that are supported by evidence and can be easily implemented and utilized by anesthesia providers should be explored and instituted. By adopting a policy of monitoring intracuff LMA pressures and ensuring that proper pressures are maintained, anesthesia providers can have the opportunity to improve patient outcomes and satisfaction, while also providing a method to ensure that possible financial penalties will not be assessed.

Specific Aims

The purpose of this project was to develop a practice guideline and policy based on a review of the evidence, to increase the usage of intraoperative manometry of LMA intracuff pressures to decrease the incidence of POST in patients undergoing general anesthesia utilizing LMAs. The use of LMAs for general anesthetics is a common

occurrence and is viewed as a less invasive procedure than endotracheal intubation. However, the use of LMAs is not without risks including, but not limited to: (a) aspiration of gastric contents, (b) trauma, (c) injuries to nerves or vascular structure due to compression, and (d) hoarseness and sore throat (Michalek et al., 2015).

The focus of this project was to develop an evidence-based policy and guidelines supporting the use of intraoperative manometry monitoring to maintain intracuff pressures at or below the recommended 60 cm H₂O, thereby reducing the occurrence of POST in patients on which LMA devices are utilized. Manometers are inexpensive, readily available, and easy to operate. Little effort and time are needed to perform these assessments and, with evidence showing that LMA cuffs are most often over-inflated, could have a significant impact on patient outcomes regarding POST as well as other complications associated with the use of LMAs.

DNP Essentials

According to the American Association of Colleges of Nursing (AACN) (2006), eight essential elements must be met for fulfillment of the DNP objectives for this project. Essentials I, II, and VIII were highlighted in this project. However, all eight DNP essentials were met in the completion of this project and are outlined in detail in Appendix A.

Summary

Inherent risks are always associated with the use of any anesthetic method. While some complications may be viewed as minor, the realization that patients may not perceive them as such is of importance. Anesthesia providers must utilize current,

evidence-based practices to mitigate the risks associated with anesthesia, minor or not. POST is an extremely common complication, but utilizing manometry monitoring has been shown, by the evidence presented in this report, to decrease its incidence and/or severity.

CHAPTER II – METHODS

Context

This project was submitted to The University of Southern Mississippi's (USM) institutional review board (IRB) for approval (Protocol #18071903), as well as a medium-sized regional hospital in southeast Mississippi for implementation approval. The contextual elements of the problem being addressed by this project must be discussed. These elements include: (a) current facility practices, (b) knowledge of literature concerning LMAs and POST, (c) contraindications to the use of LMAs, (d) barriers to the use of intraoperative manometry, and (e) the potential benefits that could be derived from the adoption of the proposed practice guidelines.

The use of manometry to measure and ensure that maximum intracuff pressures are not being exceeded after the insertion of LMAs is not routinely practiced (Seet et al., 2010). However, evidence suggests that utilizing intraoperative manometry to control LMA intracuff pressures could lead to a decrease in the number of patients who experience POST and, as a result, are dissatisfied with their surgical experience. While several factors may contribute to the development of POST after LMA use, evidence suggests that intracuff pressures exceeding the recommended 60 cm H₂O significantly contribute to complications, including POST (El-Boghdadly et al., 2016).

Understanding the anesthesia provider's knowledge of current evidence regarding the effects of intracuff pressures on the development of POST must be assessed. The provider's access to manometers must also be discerned. Lastly, providers must understand the potential effects that POST may have on patient satisfaction and the financial implications this might have on the facility.

Design

In developing this clinical practice guideline, a thorough review of the evidence was performed utilizing the following search databases: CINAHL, EBSCOhost, MEDLINE, and Google Scholar. The keywords used included supraglottic airway, post-operative sore throat, sore throat, laryngeal mask airway, manometer, and intracuff monitoring. A team of experts at the facility was assembled and include the chief of anesthesiology, chief certified registered nurse anesthetist (CRNA), and the CRNA staff at the facility. An in-service was held for the team of experts at which the clinical practice guidelines and policy was presented recommending the use of intraoperative manometry monitoring after the insertion of an LMA to measure intracuff pressures. The presentation included a PowerPoint that was made available by the team of experts as well as the entire anesthesia staff for review. The team was then provided with an evaluation tool to assess the team's willingness to adopt the guideline. The team was also asked to provide feedback that will be used by the author to revise the guideline to better meet the needs of the providers and the facility. Based on the feedback received from the team of experts, a policy and executive summary based on best practice guidelines were developed. Adoption was suggested indicating the potential to significantly reduce the incidence of POST following LMA usage. The goal was to provide the team of experts with a clinical practice guideline based on carefully reviewed evidence suggesting that adoption of this practice can significantly reduce the incidence of POST and lead to higher patient satisfaction scores.

Team Specifics

Completion of this project was accomplished with the cooperation of multiple team members. These members included the author, who was responsible for the development of the clinical practice guideline, an in-depth review of the evidence, and presentation of the proposed guideline to a team of experts. The team of experts was to consist of the chief anesthesiologist, chief CRNA, and three staff CRNAs. However, the director of anesthesiology was not in attendance at the presentation. The chief CRNA and staff CRNAs were present and reviewed the clinical practice guideline and provided feedback to the author, using an evaluation tool, which allowed for appropriate revisions to the guideline. A policy was developed, attached to the executive summary, and presented to the team of experts utilizing feedback garnered from the evaluation tool. An evaluation tool consisting of four short questions was developed for this project to garner feedback that was used in the final construction of the policy and executive summary. The evaluation tool was completely voluntary and anonymous. The questions asked in the tool were as follows:

1. Did this project presentation provide you with information regarding LMAs and POST?
2. Did the information provided in this presentation encourage you to reconsider your current LMA practice?

3. Would you consider changing your practice based on the information presented if given the option of manometers?
4. Please provide any comments or suggestions regarding this practice recommendation.

Analysis

The evaluation tool from the panel of experts was analyzed and comments and suggestions were compared to evidence-based literature regarding the use of LMAs and outcomes. Seventeen total surveys were returned, not only from the expert panel but also from staff CRNAs that were in attendance at the presentation. The policy was revised to reflect the feedback that falls within the acceptable practices reflected in the literature.

Ethical Considerations

Possible ethical considerations for this project were considered. While evidence suggests that the use of perioperative intracuff pressures can decrease the incidence of POST, this practice is not a current standard of care for anesthesia practice. Therefore, the decision to use manometers intraoperatively remains at the discretion of the individual clinician even with a guideline or policy in place. The decision to use manometers or not may result in two standards of care that surgical patients may receive. Patients who receive their care from a clinician who opts to follow the guideline may benefit from an intervention designed to improve their post-surgical outcome, while those receiving care from a clinician who chooses not to follow the guidelines may, in fact, be receiving suboptimal care and be subjected to an increased risk for postoperative complications.

Summary

This project sought to address a potential gap in patient care that might lead to better patient outcomes. A team of experts was constructed, and presentation of the most current evidence and guidelines was given to the team as well as staff anesthesia providers. An evaluation tool was used to gather feedback from these individuals regarding their willingness to adapt their practice according to these guidelines. All ethical considerations were addressed.

CHAPTER III - RESULTS

The goal of this DNP project was to develop a clinical practice guideline based on current evidence, as well as feedback and recommendations received from a panel of experts. The panel of experts was to include the director of anesthesiology, chief CRNA, and three staff CRNAs at the facility. A presentation was held at the facility, during which the evidence supporting the guideline was shared. After the presentation, the attendants were asked to fill out a survey consisting of four questions. Responses to these surveys were utilized to develop a policy and executive summary based on the feedback.

The presentation itself was completed in approximately 30 minutes. Unfortunately, the director of anesthesiology was not in attendance. The chief CRNA was present, as well as staff CRNAs. After the presentation, all those present were provided with the survey and asked to provide their feedback on the proposed guideline and policy. All participants were informed that the completion of the survey was completely optional and no identifying information would be collected. A total of 17 surveys were completed and returned.

All 17 respondents answered yes to the first question of the survey, which asked if the project presentation provided information regarding LMAs and POST. One respondent answered no to the second question which asked if the information provided in this project encouraged them to reconsider their current LMA practice, meaning that the other 16 respondents were open to considering new methods of LMA techniques. One respondent also answered no to the third question inquiring whether they would be willing to consider changing their practice based on the information presented if they were afforded the option of manometers. Of note, neither of the respondents who

answered no provided any further comments. Analysis of the data collected through the evaluation tool shows that the remaining 16 respondents were open to changing their clinical practice if given the option of utilizing manometers.

Summary

In summation, a panel of experts and staff CRNAs were presented with evidence based on recent literature indicating that institution of intraoperative manometry monitoring could reduce the occurrence and/or significance of POST. Feedback was gathered using an evaluation tool that was designed to elicit the providers' willingness to adopt new techniques and incorporate the use of manometers in their LMA practice. The results showed an overwhelming willingness to adopt the use of manometry monitoring in the operating room if they were provided with the opportunity.

CHAPTER IV – DISCUSSION

Interpretation

Based on feedback recorded in the evaluation tool the panel of experts and anesthesia staff were receptive to the recommendations provided in the presentation. Comments collected indicated that the providers would be amenable to the use of manometers in their practice but noted that the need to have manometers in each operating room would be necessary for successful implementation of such policy. Overall, the responses collected indicated that the anesthesia staff would be agreeable to the possibility of implementing a practice change to include intraoperative manometry monitoring.

Limitations

Limiting factors for this project include the small sample size of clinicians that were surveyed regarding this proposed practice change. Another limiting factor is the availability of manometers to anesthesia staff. It is important, for the implementation of this policy, that each operating room always have a manometer stocked for the anesthesia provider to have the ability to check and adjust LMA intracuff pressures after insertion, as well as at other moments during the anesthetic case.

Conclusions

For many patients, the inevitability of a sore throat as a consequence of general anesthesia in which an airway device is used may seem a foregone conclusion. Yet, regardless of its apparent commonality, a sore throat is an extremely undesirable complication that could significantly impact the patient's perceptions of their care, as well as their overall satisfaction with the surgical experience. Anesthesia providers must

not assume that POST is an inescapable consequence. Providers should employ evidence-based interventions that can significantly reduce the incidence of this complication. Current evidence indicates that the use of manometers can meaningfully reduce the percentage of patients who will experience this complication. The implementation of a policy requiring this convenient and simple procedure could have a profound impact on patient satisfaction, not to mention ensuring that the facility is practicing to the highest standards according to evidence-based best practices. While the use of manometers will not eliminate the occurrence of POST alone, manometers may provide yet another tool that providers utilize to ensure they are providing optimal care to the patients for which they are responsible.

Summary

The overall goal of this project was to develop a policy and practice guideline for patients who undergo general anesthesia with an LMA in place that could reduce the incidence and/or severity of POST. After a thorough review of the most recent evidence, a determination was made that best practice recommendations included the use of intraoperative manometers to evaluate intracuff pressures to ensure that maximum recommended inflation pressures were not exceeded. Feedback from the evaluation tool suggested that the panel of experts agreed that use of intraoperative manometers would be beneficial in current practice and that most were willing to consider a change in current practice methods if manometers were readily accessible. Importantly, the feedback that was accrued through the evaluation tool came from clinicians who actively participate in the care of patients that this practice change could affect. Their willingness

to review and consider best practice recommendations is important and promising bearing in mind the impact it could have on patient experience and satisfaction.

APPENDIX A – DNP Essentials

Table A1.

DNP Essentials

Doctor of Nursing Essential	How the Essential is Achieved
I. Scientific Underpinnings for Practice	This project utilized a thorough review of the literature to find evidence-based practices supporting the use of manometers to decrease the incidence of POST. The recommendations proposed in this project are based on the results of scientific works.
II. Organizational and Systems Leadership for Quality Improvement and Systems Thinking	This project sought to improve quality through recommendations to a team of experts that would review the recommendations, disseminate the information, and provide feedback that could lead to policy implementation.
III. Clinical Scholarship and Analytical Methods for Evidence-Based Practice	Analytical methods were used during a thorough review of the literature to identify best practice methods that would be used to construct a practice guideline for recommendation to the team of experts.
IV. Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care	The utilization of specific equipment to improve patient care, such as manometers, is used to achieve this essential.
V. Health Care Policy for Advocacy in Health Care	This essential is met through the identification of an area of patient care that lacks a policy. Through the development of a policy recommendation, this project could lead to the implementation of a new institutional policy.
VI. Interprofessional Collaboration for Improving Patient and Population Health Outcomes	This essential is met through the collaboration of professions on the team of experts and staff that included physicians and CRNAs.

Table A1 (continued).

VII.	Clinical Prevention and Population Health for Improving the Nation's Health	The goal of this project was to improve patient outcomes and experiences by utilizing evidence-based practice recommendations for possible future implementation
VIII.	Advanced Nursing Practice	Essential VIII is achieved by reviewing and analyzing current scientific literature, providing a presentation designed to provide the most current practice recommendations, and collaborating with other health professionals to work towards possible implementation of a new healthcare policy.

APPENDIX B – IRB Approval Letter



THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
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NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 18071903
PROJECT TITLE: Laryngeal Mask Airway: Postoperative Sore Throat Clinical Practice Guideline
PROJECT TYPE: New Project
RESEARCHER(S): Logan Williams
COLLEGE/DIVISION: College of Nursing and Health Professions
DEPARTMENT: School of Leadership and Advanced Nursing Practice
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Exempt Review Approval
PERIOD OF APPROVAL: 07/27/2018 to 07/26/2019
Edward L. Goshorn, Ph.D.
Institutional Review Board

APPENDIX C – Support Letter

Dear Dr McLain,

We are happy to work with Logan Williams on his LMA Cuff Inflation Best Practices doctoral project as one of our quality improvement initiatives. I will be working with his panel of experts to collect his surveys and secure them. Once we have confirmation that the USM IRB has approved this project, I will discuss this project with the Anderson Regional Medical Center risk management team. We look forward to this opportunity.

Thank you,

Jason Coleman CRNA, DHA
Chief Nurse Anesthetist
Meridian, MS

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APPENDIX D -Executive Summary and Policy

Running head: EXECUTIVE SUMMARY

1

Executive Summary of Best Practice Policy Recommendation for Manometry Monitoring for

Patients Undergoing General Anesthesia with a Laryngeal Mask Airway

Logan Williams

The University of Southern Mississippi

This is an executive summary of the full report “Laryngeal Mask Airways: A Postoperative Sore Throat Clinical Practice Guideline.” The student registered nurse anesthetist met with a panel of experts and anesthesia staff to present the collection of evidence regarding the use of manometers as an intervention to decrease the incidence and/or severity of postoperative sore throat (POST). The following executive summary is based off the evaluations and recommendations of the panel of experts and anesthesia staff.

Available Knowledge

Laryngeal mask airways (LMA) are commonly used in general anesthetic cases in lieu of endotracheal tubes (ETT) for a wide variety of surgical cases. Evidence suggested that the use of LMAs resulted in a decreased incidence of pharyngolaryngeal complications, including POST. However, current evidence suggests that the incidence of POST in patients receiving LMAs may still approach 70%. This alarming statistic is of concern to patients, who describe POST as one of the more undesirable post-surgical complications.

The development of POST is likely a multifactorial phenomenon, but excessive inflation of LMA intracuff to pressures exceeding the recommended 60 cm H₂O has been identified as one likely cause. Recent studies have indicated that the use of a manometer to assess and adjust LMA intracuff pressures to ensure that they remain less than 60 cm H₂O can significantly reduce the incidence of POST.

Process

An evaluation tool was used to gather feedback from the panel and anesthesia staff. The data was analyzed to assess whether the respondents found the information useful and if they were receptive to a possible change in practice. The panel of experts consisted of an anesthesiologist, chief certified registered nurse anesthetist (CRNA), and staff CRNAs. The

panel was chosen due to their expert knowledge of anesthesia practice, and their direct management of surgical patients in whom LMAs will be utilized. Analysis of the ~~respondent's~~ feedback indicated that they were provided with knowledge relating excessive inflation of LMA cuffs to POST, and that a majority would be amenable to changing their current practice regarding manometry monitoring if provided the option of having manometers readily available.

Policy Recommendation

The policy recommendation based on this review of literature and feedback from the panel of experts and other staff anesthesia providers, is that manometers should be used to measure LMA intracuff pressures immediately after insertion and at intervals throughout the case at the providers discretion. The manometer can be used to decrease intracuff pressure if it is excess of 60 cm H₂O or to increase pressures to maintain a proper seal below the maximum recommended pressure.

Policy Area: Anesthesia Department	Subject: Laryngeal Mask Airways
Title of Policy: Manometry Monitoring for Patients Undergoing General Anesthesia with Laryngeal Mask Airways	Number:
Effective Date:	Supersedes:
Approved Date:	Approved by:
Revision Date:	

1. **Rationale or background to policy:** Postoperative sore throat (POST) is a common complication following insertion of an airway device during general anesthesia. Patients in whom laryngeal mask airways (LMA) are utilized have been reported to suffer from POST in up to 70% of cases. Although this complication is widely regarded as minor, it is an undesirable outcome for patients and can negatively impact patient. While various factors likely play a role in the development of POST, one that may play a significant role is the needless over-inflation of airway cuffs by clinicians. Maximum suggested intracuff pressures for LMAs should never exceed 60 cmH₂O. Doing so can exert excessive pressures on oropharyngeal structures that may lead to a number of pharyngolaryngeal complications including, but not limited to, sore throat. While digital palpation of the cuff pilot is often used to estimate pressures, it has been shown to be ineffective. The only reliable method to accurately assess actual cuff pressures is with manometers, which not only allow for assessment of cuff pressures, but also allow the clinician to adjust pressures by adding or removing air from the cuff to ensure that a proper seal is maintained without exceeding maximum cuff pressures. See reference list below.
2. **Policy:** All anesthesia providers will use manometer to assess LMA intracuff pressures immediately after insertion, and throughout the surgical procedure on all patients undergoing general anesthesia with LMAs. Intracuff pressures should not exceed 60 cmH₂O.
3. **Procedure:**
 1. Anesthesia providers will perform a detailed preoperative assessment. The type of surgical procedure, ~~patient's~~ physical status, health history, and airway classification will be assessed to determine if use of an LMA is appropriate.
 2. The anesthesia provider will choose the appropriate size LMA for the individual patient based on their weight in kilograms. All equipment necessary for insertion should be readily available.

3. After the patient is connected to all monitors, preoxygenated with 100% fraction of inspired oxygen (FiO_2) and properly anesthetized the LMA should be inserted per one of the approved insertion techniques.
4. Proper LMA placement should be confirmed by the presence of end-tidal carbon dioxide (ETCO_2), equal bilateral chest rise, and auscultation of bilateral equal breath sounds. A manometer should then be attached to the pilot balloon of the LMA cuff to ensure that cuff pressures do not exceed the maximum recommended pressure of 60 cmH_2O .
5. The manometer can be used to adjust intracuff pressures to ensure that a proper seal is maintained at levels lower than 60 cmH_2O . Air can be added or removed from the cuff as needed by the provider.

APPENDIX E – Evaluation Tool

Evaluation Tool

Participation in this anonymous questionnaire is voluntary. There are no repercussions for nonparticipation. Thank you for your time.

Please answer the following questions with a yes or no response.

- 1) Did this project presentation provide you with information regarding laryngeal mask airways (LMA) and postoperative sore throat (POST)?
 - a. Yes
 - b. No
- 2) Did the information provided in this presentation encourage you to reconsider your current LMA practice?
 - a. Yes
 - b. No
- 3) Would you consider changing your practice based on the information presented if given the option of manometers?
 - a. Yes
 - b. No
- 4) Please provide any comments or suggestions regarding this practice recommendation.

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